B.E., BIOMEDICAL ENGINEERING

SEMESTER	COURSE	COURSE OUTCOMES	BLOOMS TAXONOMY
SEMESTER - I	HS3152: Professional English - I	CO1: To use appropriate words in a professional context.	K3
		CO2: To gain understanding of basic grammatic structures and use them in right context.	K2
		CO3: To read and infer the denotative and connotative meanings of technical texts.	K1
		CO4: To write definitions, descriptions, narrations and essays on various topics.	K1
	MA3151: Matrices and Calculus	CO1: Use the matrix algebra methods for solving practical problems.	K3
		CO2: Apply differential calculus tools in solving various application problems.	K3
		CO3: Able to use differential calculus ideas on several variable functions.	K3
		CO4: Apply different methods of integration in solving practical problems.	K3
		CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.	K3

SEMESTER-I	**PH3151: Engineering Physics**	CO1: Understand the importance of mechanics.	K2
		CO2: Express their knowledge in electromagnetic waves.	K1
		CO3: Demonstrate a strong foundational knowledge in oscillations, optics and lasers.	K3
		CO4: Understand the importance of quantum physics.	K2
		CO5: Comprehend and apply quantum mechanical principles towards the formation of energy bands.	K3
	CY3151: Engineering Chemistry	CO1: To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.	K2
		CO2: To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.	K3
		CO3: To apply the knowledge of phase rule and composites for material selection requirements.	K3
SEMESTER-I		CO4: To recommend suitable fuels for engineering processes and applications.	K5
		CO5: To recognize different forms of energy resources and apply them for suitable applications in energy sectors.	K1
		CO1: Develop algorithmic solutions to simple computational problems.	K6

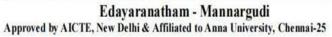|		CO2: Develop and execute simple Python programs.	K6
	GE3151: Problem Solving and Python Programming	CO3: Write simple Python programs using conditionals and loops for solving problems.	K1
		CO4: Decompose a Python program into functions	K4
		CO5: Represent compound data using Python lists, tuples, dictionaries etc.	K5
		CO6: Read and write data from/to files in Python programs	K1
SEMESTER - I	**GE3171: Problem Solving and Python Programming Laboratory**	CO1: Develop algorithmic solutions to simple computational problems.	K6
		CO2: Develop and execute simple Python programs.	K6
		CO3: Implement programs in Python using conditionals and loops for solving problems.	K3
		CO4: Deploy functions to decompose a Python program.	K6
		CO5: Process compound data using Python data structures.	K4
		CO6: Utilize Python packages in developing software applications.	K3
	BS3171: Physics and Chemistry Laboratory	PHYSICS LABORATORY CO1: Understand the functioning of various physics laboratory equipment.	K2
		CO2: Use graphical models to analyze laboratory data.	K3

		CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.	K3
		CO4: Access, process and analyze scientific information.	K4
		CO5: Solve problems individually and collaboratively.	K3
	BS3171: Physics and Chemistry Laboratory	CHEMISTRY LABORATORY CO1: To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.	K4
		CO2: To determine the amount of metal ions through volumetric and spectroscopic techniques	K3
		CO3: To analyse and determine the composition of alloys.	K4
		CO4: To learn simple method of synthesis of nanoparticles	K1
		CO5: To quantitatively analyse the impurities in solution by electroanalytical techniques	K4
	GE3172: English Laboratory	CO1: To listen to and comprehend general as well as complex academic information	K1
		CO2: To listen to and understand different points of view in a discussion	K1
		CO3: To speak fluently and accurately in formal and informal communicative contexts	K1
		CO4: To describe products and processes and explain their uses and	K1

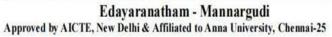|			
		purposes clearly and accurately	
		CO5: To express their opinions effectively in both formal and informal discussions	K1
	HS3252: Professional English - II	CO1: To compare and contrast products and ideas in technical texts.	K4
		CO2: To identify and report cause and effects in events, industrial processes through technical texts	K1
		CO3: To analyse problems in order to arrive at feasible solutions and communicate them in the written format.	K4
		CO4: To present their ideas and opinions in a planned and logical manner	K2
		CO5: To draft effective resumes in the context of job search.	K2
SEMESTER - II	**MA3251: Statistics and Numerical Methods**	CO1: Apply the concept of testing of hypothesis for small and large samples in real life problems.	K3
		CO2: Apply the basic concepts of classifications of design of experiments in the field of agriculture.	K3
		CO3: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	K5
		CO4: Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	K2
		CO5: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	K3

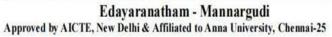|			
	BM3252: Medical Physics	CO1: Interpret the properties of electromagnetic radiations and its effect on human.	K2
		CO2: Apply the principles and understand the production of radioactive nuclides.	K3
		CO3: Explain the interaction of radiation with matter.	K1
		CO4: Identify and Analyse the radiation quantities and its effects	K1
		CO5: Demonstrate the knowledge on the properties of sound and its application in medicine.	K3
	BE3251: Basic Electrical and Electronics Engineering	CO1: Compute the electric circuit parameters for simple problems	K3
		CO2: Explain the working principle and applications of electrical machines	K1
		CO3: Analyze the characteristics of analog electronic devices	K4
		CO4: Explain the basic concepts of digital electronics	K1
		CO5: Explain the operating principles of measuring instruments	K1
SEMESTER - II	**GE3251 : Engineering Graphics**	CO1: Use BIS conventions and specifications for engineering drawing.	K3
		CO2: Construct the conic curves, involutes and cycloid.	K6
		CO3: Solve practical problems involving projection of lines.	K3
		CO4: Draw the orthographic, isometric and perspective projections of simple solids	K6

		CO5: Draw the development of simple solids.	K6
	BM3251: Biosciences for Medical Engineering	CO1: Explain the fundamentals of biochemistry	K1
		CO2: Analyze structural and functional aspects of living organisms	K4
		CO3: Explain the function of microscope	K1
		CO4: Describe methods involved in treating the pathological diseases.	K3
	GE3271 : Engineering Practices Laboratory	CO1: Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.	K6
		CO2: Wire various electrical joints in common household electrical wire work.	K6
		CO3: Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.	K6
		CO4: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.	K6
SEMESTER - II	**BM3271: Biosciences Laboratory**	CO1: Understand the Biochemistry laboratory functional components	K2
		CO2: Have a sound knowledge of qualitative test of different biomolecules.	K1
		CO3: Understand the basics knowledge of Biochemical parameter and their interpretation in Blood sample.	K2

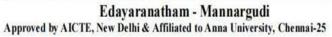|		CO4: Have a sound knowledge of separation technology of proteins and amino acids.	K1
		CO5: Student can perform practical experiments on staining Processes.	K2
	GE3272 : Communication Laboratory / Foreign Language	CO1: Speak effectively in group discussions held in formal/semi formal contexts.	K1
		CO2: Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions	K4
		CO3: Write emails, letters and effective job applications.	K6
		CO4: Write critical reports to convey data and information with clarity and precision	K6
		CO5: Give appropriate instructions and recommendations for safe execution of tasks	K2
SEMESTER - III	**MA3351 : Transforms And Partial Differential Equations**	CO1: Understand how to solve the given standard partial differential equations.	K2
		CO2: Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.	K3
		CO3: Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.	K5
		CO4: Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve	K2

		some of the physical problems of engineering.	
		CO5: Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.	K3
SEMESTER - III	**BM3353 :** **Fundamentals Of Electronic Devices And Circuits**	CO1: Analyze the characteristics of semiconductor diodes.	K4
		CO2: Analyze and solve problems of Transistor circuits using model parameters.	K4
		CO3: Identify and characterize diodes and various types of transistors.	K1
		CO4: Analyze the characteristics of special semiconductor devices.	K4
		CO5: Analyze the characteristics of Power and Display devices.	K4
	BM3301: Sensors And Measurements	CO1: Measure various electrical parameters with accuracy, precision, resolution.	K5
		CO2: Select appropriate passive or active transducers for measurement of physical phenomenon.	K1
		CO3: Select appropriate light sensors for measurement of physical phenomenon	K1
		CO4: Use AC and DC bridges for relevant parameter measurement.	K3
		CO5: Employ multimeter, CRO and	K3

		different types of recorders for appropriate measurement.	
SEMESTER - III	**BM3352: Electric Circuit Analysis**	CO1: Comprehend and design ac/dc circuits.	K4
		CO2: Apply circuit theorems in real time.	K3
		CO3: Evaluate ac/dc circuits.	K5
		CO4: Analyse the electrical circuits	K4
		CO5: Develop and understand ac/dc circuits.	K6
	BM3351: Anatomy And Human Physiology	CO1: Identify and explain basic elements of human body	K1
		CO2: Explain the functions of skeletal and muscular system	K1
		CO3: Describe the structure, function of cardiovascular system and respiratory system	K1
		CO4: Discuss the structure of digestive and excretory system.	K2
		CO5: Describe the physiological process of Nervous and sensory system	K1
	CS3391: Object Oriented Programming	CO1: Apply the concepts of classes and objects to solve simple problems	K3
		CO2: Develop programs using inheritance, packages and interfaces	K6
		CO3: Make use of exception handling mechanisms and multithreaded model to solve real world problems	K3
		CO4: Build Java applications with I/O packages, string classes, Collections and generics concepts	K6

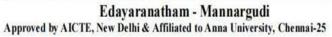|			
		CO5: Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications	K4
SEMESTER - III	**BM3361: Fundamentals Of Electronic Devices And Circuits Laboratory**	CO1: Experiment and determine the VI characteristics of given PN junction diode, Zener diode, Photo diode and Silicon Controlled Rectifier	K3
		CO2: Experiment and determine the Input & output characteristics of BJT	K3
		CO3: Experiment and test half wave and full wave rectifier circuit using PN Junction diode and 69 obtain the ripple factor, rectifier efficiency and experiment and test voltage regulation characteristics using Zener diode voltage regulator circuit.	K5
		CO4: Experiment and test the given electric circuit using Kirchhoff's laws and obtain the mesh current & node voltage and obtain the load current for the given circuit using Superposition, Thevenin's, and Norton's and Reciprocity theorems.	K5
		CO5: Construct and test RLC series and parallel circuits to compute the resonant frequency and bandwidth by plotting the frequency response.	K5
SEMESTER - III	**BM3311: Sensors And Measurements Laboratory**	CO1: design and understand characteristics and calibration of various transducers.	K6
		CO2: design and develop bridge circuits to find unknown variables.	K6
		CO3: select proper transducer for various applications.	K1

		CO4: understand various read out and display devices	K2
		CO5: design a measurement system for various applications.	K6
	CS3381: Object Oriented Programming Laboratory	CO1: Design and develop java programs using object oriented programming concepts	K6
		CO2: Develop simple applications using package, exceptions, multithreading, and generics concepts	K6
		CO3: Create GUIs and event driven programming applications for real world problems	K6
	GE3361: Professional Development	CO1: Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements	K3
		CO2: Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding	K3
		CO3: Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.	K3
SEMESTER - IV		CO1: Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.	K1
		CO2: Demonstrate accurate and efficient use of advanced algebraic techniques.	K3

	MA3355: **Random Processes And Linear Algebra**	CO3: Apply the concept of random processes in engineering disciplines.	K3
		CO4: Understand the fundamental concepts of probability with a thorough knowledge of standard distributions that can describe certain real-life phenomenon.	K2
		CO5: Understand the basic concepts of one and two dimensional random variables and apply them to model engineering problems.	K2
SEMESTER – IV	**BM3491 :** **Biomedical Instrumentation**	CO1 : Illustrate the origin of various biological signals and their characteristics.	K4
		CO2: Gain knowledge on characteristics of bio signals.	K2
		CO3: Gain knowledge on various amplifiers involved in monitoring and transmission of biosignals.	K2
		CO4: Explain the different measurement techniques for non-electrical bio-parameters	K1
		CO5: Explain the biochemical measurement techniques as applicable for diagnosis and further treatment	K1
	BM3402: **Analog And Digital Integrated Circuits**	CO1: design new analog linear circuits and develop linear IC based Systems.	K6
		CO2: Apply the concept of ADC and DAC in real time systems and Phase Locked Loop with applications.	K3
		CO3: Use Boolean algebra and apply it to digital systems.	K3

		CO4: Design various combinational digital circuits using logic gates.	K6
		CO5: Bring out the analysis and design procedures for synchronous and asynchronous sequential circuits.	K2
SEMESTER - IV	**BM3451 :** **Bio Control Systems**	CO1: Interpret the need for mathematical modeling of various systems, representation of systems in block diagrams and signal flow graphs and are introduced to biological control systems	K2
		CO2: Determine the time response of various systems	K3
		CO3: discuss the concept of system stability	K4
		CO4: Examine the frequency response characteristics of various systems using different charts	K3
		CO5: Appraise the concept of modeling basic physiological systems	K5
	BM3401: **Signal Processing**	CO1: To classify the continuous time and discrete time signals and systems.	K2
		CO2: To analyze the signals in both continuous time and discrete time	K4
		CO3: To apply DFT for the analysis of digital signals & systems	K3
		CO4: To design IIR filter to process real world signals.	K6
		CO5: To design FIR filter to process real world signals.	K6

SEMESTER - IV	**GE3451:** **Environmental Sciences And Sustainability**	CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.	K1
		CO2: To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.	K1
		CO3: To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.	K1
		CO4: To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K1
		CO5: To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.	K3
	BM3411: **Biomedical Instrumentation Laboratory**	CO1: Design the amplifier for Bio signal measurements	K6
		CO2: Measure heart rate and heart sounds.	K5
		CO3: Record and analyze pulse rate and respiration rate	K4
		CO4: Measure blood pressure and blood flow	K5

	BM3412: **Analog And Digital Integrated Circuits Laboratory**	CO1: Design Combinational Circuits using logic gates	K6
		CO2: Design and implement arithmetic circuits for different applications using opamp	K6
		CO3: Design Sequential Circuits using logic gates	K6
		CO4: Design wave form generators and analyse their characteristics	K6
		CO5: Simulate and analyse circuits using ICs	K3